Vol. 7, Part 2, April, 1961 5s. per annum

COMMONWEALTH PHYTOPATHOLOGICAL NEWS

A QUARTERLY REVIEW OF NEWS AND VIEWS ISSUED BY THE COMMONWEALTH MYCOLOGICAL INSTITUTE, KEW, SURREY

TAXONOMIC MYCOLOGY IN PRESENT DAY PLANT PATHOLOGY

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[This is a controversial subject which was discussed at the 6th Commonwealth Mycological Conference held in London last July. The views of one of the leading plant pathologists of the Commonwealth is presented to readers of C.P. NEWS. The full report of the Conference will be issued later in the year; obtainable from C.M.I.]

In 1959, "Plant Pathology Problems and Progress 1908-1958" was published to commemorate the Golden Jubilee of the American Phytopathological Society. It contains the text of a number of invited addresses on the historical and developmental aspects of plant pathology and a comprehensive series of international symposia intended to cover "the many facets of plant pathology". As an historical review and as a portrayal of present interests and trends in phytopathological research you will, I believe, agree with me that it has fulfilled its purpose admirably. The symposium sections of this volume clearly indicate the tremendous change that has taken place in plant pathological research in the last fifty years and particularly in the last thirty years. The symposia are grouped under such subjects as the physiology of parasitism, the mechanisms governing pathogenicity and disease resistance, the mode of action and chemistry of fungicides, the structure and multiplication of plant viruses, etc. Clearly, the plant biochemist, the plant physiologist, the geneticist, physicist, and chemist have elbowed the classical mycologist from the centre of the phytopathological stage. From its revered position as father of plant pathology, taxonomic mycology has declined to the role of grandfather of plant pathology, and indeed seems to be in danger of imminent demise.

Let me recall some of the events of this critical thirty years of mycological dilution as seen from the pedestrian side of the phytopathological super-highway, or, perhaps, more correctly, from around the corner of a Canadian mycological herbarium case. The sentiment expressed so eloquently by Whetzel (1928) was almost prophetic when he said, "There must be no evasion of the fact that the diseased plant is the central figure in the phytopathological drama.... The disease concept must condition and rationalize all other concepts of our science..... The causal organism, where such is involved, must be relegated to its distinctly secondary role." Whetzel was not the first to enunciate such a view but it became the battle cry that was taken up by many who followed. Its echo still reverberates strongly, for Horsfall and Dimond (1959) refer to the golden age of mycology in these words. "For a hundred years, more or less beginning in the

Library
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early part of the 19th century, when mycology dominated the scene, diseases came to be equated with microbial pathogens and diseases were thus classified on the basis of causal organisms." The theme that the diseased plant is the primary consideration of plant pathology is the basis of organization of volume 1 of the series of text books edited by Horsfall and Dimond.

Even the most devout mycologist must concede that thirty years ago phytopathology was at the crossroads. Mycologists had done a heroic job in providing at least the temporary solution of many urgent plant disease problems but the importance of other microbial pathogens, the bacteria, nematodes, and viruses, was apparent. Also, the rapid advances in knowledge and techniques in plant physiology, plant biochemistry and genetics, and cytology provided the tools for more penetrating studies of the interaction of host and pathogen, of antibiosis and of chemical fungicides. The sophisticated physical and chemical instrumentation developed during this period furnished the means, for example, for not only the isolation and characterization of plant viruses, but also investigation of their physical and chemical organization. While applauding these achievements, mycologists, and especially taxonomic mycologists, have begun to wonder whether the pendulum has not swung too far. They fear that a generation hence might find us in the anomolous position of being able to expound the most intimate details of the physiological processes of infection and resistance without anyone left to tell us what pathogen we are extolling. But taxonomy will always be part of the basic vocabulary of biology; without it we are helpless to communicate with others.

Let me refer to a recent incident that illustrates the experience many mycologists encounter from time to time. Biochemical interest in a culture of a fungus derived from a fruiting body was stimulated when it was found that this culture was a rich source for the production of galactose oxidase. Presumably, the fruiting body from which the culture was derived was sent to a competent mycologist who identified it as Polyporus tomentosus. Publication of the information that P. tomentosus was a source of galactose oxidase resulted in several requests for cultures of this species from our stock culture collection. None of these cultures performed in the prescribed manner. As you have already guessed, examination of the original culture disclosed that it was Dactylium dendroides (Bull.) Fr., parasitic on the specimen of P. tomentosus.

Briefly, let me go back in history to outline the development of plant pathology in Canada. Plant pathology in North America dates back less than 100 years to the era of such pioneers as Farlow, Scribner, Galloway, Bessey and others. It was an imported science, its knowledge and training borrowed from the European schools of de Bary and Koch. A period of 25 years was required for plant pathology to make its way across the Atlantic Ocean to the United States and another 35 years elapsed before it reached Canada. It was in 1909 that the first plant pathologist, H. T. Güssow, was appointed to the federal Department of Agriculture.

As in Europe, plant pathology in North America found its strength in the able mycologists of this early era. Plant pathology was, in fact, not much more than applied mycology; the taxonomy and biology of the causal fungi leading to control recommendations. In Canada, reference may be made to the contributions of such early mycologists as Buller and Bisby (University of Manitoba), Fraser and Dickson (McGill University), Faull and Jackson (University of Toronto), John Dearness (London, Ontario). Even with such a strong base to build upon, plant pathology in Canada has developed more slowly than in other countries. It is, perhaps, understandable when one considers our small population and limited financial resources in relation to the extensive agricultural and forest areas, the diversity of crops, the variation in soils and climatic regions. We could not very well afford to divert much of our applied research effort to the more fundamental aspects of plant pathology without impairing the research program concerned with urgent grower problems. It is true that many of our problems are similar to those in the United States and the temperate regions of Europe and that we have borrowed heavily from them. Nevertheless, considering the limitations of our research resources and the heavy demands of the agricultural and forest industries, it is a tribute to such men as Güssow, Craigie, Neatby and Hanna through whose personal research and organizational foresight our program of applied research in the Research Branch of the Canada Department of Agriculture is supported by basic or fundamental research. In the 50 years since Güssow's appointment as the sole mycologist-pathologist-botanist in the federal department there has been an expansion of professional staff in pathology and mycology until today the number

exceeds 170. Although only a small part of this staff is engaged in basic research I might make special reference to such centres as the virus research group of the Research Station in Vancouver, British Columbia, the group devoted to the study of host-parasite relations in the rusts at the Research Station, Winnipeg, Manitoba, and the Pesticide Research Institute at London, Ontario. So much for credentials.

Rather by force of circumstances than by design we have not forsaken taxonomic mycology in favour of the more glamorous frontiers of biochemical-physiology-phytopathology to the degree that it has happened in certain other countries. To this extent we must admit our backwardness! In the systematic mycology unit of the Plant Research Institute at Ottawa there is a staff of 17 mycologists, at least some of whom are familiar to you. I might mention such names as Groves for his contributions in the Dermatiaceae, Sclerotiniaceae, Agaricaceae, and seed-borne fungi; Nobles, who has made a notable contribution to the knowledge of wood-destroying Hymenomycetes; Savile, for his work on the rusts; Hughes, who has caused so much consternation with his proposed revision of nomenclature in the Hyphomycetes; Gordon (Winnipeg), for his contribution to the clarification of the Fusarium complex. That the majority of the most important economic plant disease problems in Canada, as elsewhere, are caused by fungi and are likely to continue so is apparent. That much remains to be learned of the taxonomy and phylogeny of these fungi as well as their cytology, physiology, sexuality, evolution, and habit is equally evident. That we have a substantial number of mycologists to undertake this task is fortuitous but reassuring. That we shall be able to maintain this position is dubious as sources of trained mycologists dry up.

A striking example, based on Canadian experience, of the continuing need for a sound taxonomic framework upon which plant pathological knowledge can be rationally accumulated is to be found in the work of Nobles (1948). Until 1948, relatively few of the wood-inhabiting fungi isolated from decay of forest and ornamental tree species could be identified by cultural characters in the absence of fruiting bodies. It was the painstaking studies over a period of many years of the detailed macroscopic and microscopic characters of cultural isolates from decayed wood and correlation with cultures from identified fruiting structures that enabled Nobles to provide forest pathologists with workable keys for the identification of most of the commonly occurring wood-destroying fungi. The possibility of assessing the importance of these diseases and establishing the distribution, host range, etiology, etc., of these fungi was realized. Without this taxonomic tool we would still be in the darkness of the deep forest. In addition to the applied importance of this taxonomic study, there has emerged a revaluation of possible phylogenetic relationships in the Polyporaceae (Nobles, 1958).

Consider, for example, the confusion that synonymy of the dwarf bunt fungus has created. For many years dwarf bunt was not recognized as distinct from common bunt. Young (1935) recognized that the two diseases were not the same and considered the dwarf bunt fungus as a variety of Tilletia caries. Holton (1941) distinguished it as a race of T. caries and later Fischer (1952) showed that it was morphologically different from the common bunt fungus and designated the pathogen as a new species, Tilletia brevifaciens. Conners (1954) pointed out that T. brevifaciens was not specifically distinct from T. contraversa described by Kühn in 1875. By this means Conners showed that far from being confronted with a new disease problem, the pathologist had available for the taking a great deal of information on the distribution and host range of the pathogen of a disease of long standing. The hunt was on. Duran and Fischer (1956) re-examined herbarium specimens from many sources and listed some eight synonyms of T. contraversa. Fischer and Duran (1956) have summarized the earliest records of dwarf bunt in North America (and in Europe and Asia) and have shown that it occurred as early as about 1860 in New York State. From a pathological point of view clarification of nomenclature and distribution in this case is particularly significant. The dwarf bunt fungus differs from the common bunt pathogen in one important respect in that the spores may remain dormant in the soil for several years before germinating. Seed treatment, so effective against common bunt which is seed-borne, is not effective against soil-borne spores of dwarf bunt. Recognition of the fact that two distinct pathogens were involved has paved the way for an understanding of biological differences. Similarly, recognition of the distinction between the

two species is essential in the breeding for bunt-resistant varieties of winter wheat.

How can the plant pathologist acquire a full appreciation of pathogenesis without the mycological correlation of the imperfect and perfect states and their relative pathogenic importance? Clark and Zillinsky (1960) have recently shown, for example, that ascospores of Leptosphaeria avenaria f. sp. avenaria (imperfect stage, Septoria avenae f. sp. avenae) were the principal source of primary infection, a fact long overlooked in the epidemiology of this disease. I am certain that many similar examples immediately occur to you. Without knowledge of the perfect stage, variability in the pathogen through segregation and recombination of genetic factors governing pathogenicity poses an impenetrable barrier to the genetic interpretation of host-parasite relations. How many important pathogens are there in which the connection between perfect and imperfect stages have not yet been established?

Traditionally, the universities have treasured their prerogative in the non-applied or basic areas of research, for it is only in an atmosphere of advanced liberal thought that the responsibility of the teacher can be effectively discharged. It was in this liberal climate that classical mycology flourished and it is here that research and teaching of taxonomic mycology should be safeguarded, free from the vagaries of governmental and industrial pressures. How natural that when phytopathology entered the new era of physiological emphasis that the universities should take the lead. But freedom is not synonymous with irresponsibility. Plant pathologists have in the past been endowed at the university with a solid mycological training no matter at what level or direction their future researches were to take. What could be more 'basic' to the study of the diseased plant than the organism that causes the disease? I do not for one moment suggest that we go back to the position of thirty years ago when our knowledge of the physiology of parasitism was all but non-existent. Neither do I advocate the equally untenable position of arresting mycological research and committing all our resources to the physiological and biochemical viewpoint. Obviously, what is required is a recognition of the necessity of maintaining a balanced complementary training and research programme.

That mycology will not be entirely neglected in this headlong rush to the new sciences is assured in Canada. There, over 80 per cent. of the plant pathologists engaged in research are in government employ and the responsibility of governmental agencies lies in the achievement of practical objectives in the solution of disease problems confronting its most important primary industries. These considerations constitute a sobering force that will influence the type of training given at the university.

HERB. I.M.I. HANDBOOK

Methods in use at the Commonwealth Mycological Institute

vii + 102 pp., 6 plates, 8 figs., 1960

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FROM NEAR AND FAR

According to a National Science Foundation report published in 1960 the United States spent, between 1953 and 1958, a sum of $830 million on basic research. On research and development as a whole expenditure rose from $5,000 million to $10,000 million. Federal support for basic research increased by 117 per cent., whilst that from industry by only 69 per cent.

The American Chemical Society has a membership of 90,000 with a budget of more than $10 million. Its new building in Washington D.C. has been dedicated "to the scientific and professional advancement of chemistry and chemical engineering". It cost $4 million and houses but half of the 600 employees of the Society.

Courses in microbiology leading to the examination for endorsed certificates of the Institute of Biology are now being held at 13 colleges of technology in U.K. Sixty three out of 106 students passed the Ordinary Level, and 23 out of 25 the higher Level in 1960. One course is training technicians in plant pathology.

Of the £2¼ million odd allocated for research under Colonial Development and Welfare schemes during the 1959-60 fiscal year, over £1 million was devoted to agricultural projects and over half a million pounds to insecticides.

What is claimed to be the world's first "atomic" barley has arrived in U.K. from Sweden. The variety, Pallas, has been produced from an irradiated seed.

A symposium on The Soil: Problems Raised by its Use and Misuse was held in March jointly by the London branches of the Royal Institute of Chemistry, the Institute of Physics and the Physical Society, and the Institute of Biology. It commenced with a paper by Sir John Russell on "Soil as an Environment for Life" and included a contribution by Dr. S.D. Garrett on "Farming Patterns and Soil-borne Crop Diseases". This is the first joint symposium held by the three institutes.

Association of Applied Biologists

Council of the A.A.B. has nominated the following officers for 1961-62

President: P.W. Brian
Vice-President: Mrs. M.A. Watson
President-elect: Professor H.G.H. Kearns
Treasurer: F. Raw
General Secretary: L. Broadbent, Glasshouse Crops Research Institute, Rustington, Littlehampton, Sussex.

The Association is raising a Memorial Fund to the late Dr. H.F. Barnes in recognition of his great services to its interests. The fund will be used to sponsor memorial lectures. Contributions are invited and should be sent to Dr. Raw at Rothamsted Experimental Station, Harpenden, Herts.

Publications of Interest

Virologists will be interested in the ANNUAL REPORT 1958-59 of the Federal Department of Agricultural Research, Nigeria. It records most interesting research carried out on the life history of the white fly vector of cassava mosaic and tobacco leaf curl and deals in some detail with host plant relationships and factors influencing the build up and sudden decrease of the insect population.

Dr. P.W. Brian has contributed a valuable review of the gibberellins in SCIENCE PROGRESS 49, No. 193, 1961.

PESTICIDES ABSTRACTS AND NEWS SUMMARY (PANS) published by the Colonial Pesticides Research Committee, Colonial Office, London is launching a

new venture by the issue of a section dealing with fungicides. This useful publication gives advance information not to be found in other periodicals. It is now under the editorship of G. Ordish.

The Uganda Department of Agriculture has recently published an extremely well got up and informative brochure on its Research Division. It outlines history, aims, and scientific activities and contains a staff list and list of publications up to 1960. It was compiled by Dr. E. M. Chenery, the then Chief Research Officer.

The European Association for Potato Research will publish on the occasion of the F.A.O. Seed Year 1961 a special number of the EUROPEAN POTATO JOURNAL devoted to seed potato research, probably as an extra issue in the coming autumn. Contributions are being invited from members by the E.A.P.R., P.O. Box 20, Wageningen, The Netherlands.

D. M. Henderson of the Royal Botanic Garden, Edinburgh, Scotland, is appealing for new information on British rust fungi for inclusion in a new rust flora on which the late Dr. Malcolm Wilson worked for so many years. The text is nearly ready for press.

SABOURAUDIA. January 1961 saw the publication of the first number of Sabouraudia, Journal of the International Society for Human and Animal Mycology, a periodical devoted to original papers on all aspects of mycoses of man and animals. The Editor is Dr. J. C. Gentles, University of Glasgow, Anderson College, 56 Dunbarton Road, Glasgow, W1. The publisher is E. & S. Livingstone Ltd., 15-17 Teviot Place, Edinburgh 1, and the subscription £4 per volume (of 4 parts).

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'Black-cross':

A NEWLY RECORDED DISEASE OF BANANAS

A disease of bananas provisionally referred to as 'black-cross' has been known for the past four years. It occurs widely on bananas in New Guinea and the large islands of New Britain and Bougainville.

Stromata of Phyllachora sp. causing 'black cross' disease of bananas

The cross is formed by its mode of growth and it has been most frequently collected as a sterile, abaxial stroma. From a point on a main lateral vein of a leaf the fungus grows out roughly as a four pointed star the two dominant arms developing along the vein for about 3 cms. on either side. Simultaneously, two shorter arms grow out at right angles and parallel to the midrib of the leaf for ·5 - ·75 cm. on either side of the vein, thus forming a cross.

Fertile material with mature ascospores was first collected by Dr. Dorothy Shaw in June 1960, when in the humid atmosphere of the Markham Valley, Papua. Material was found in which white masses of spore exudates occurred along the arms of the fungoid stroma. Examination of these proved the fungus to be a Phyllachora sp. Considerable efforts were made to get both the exuded spores and those remaining in the perithecia into culture. Isolations were carried out both in Papua and at the Commonwealth Mycological Institute but without success. This is a common character of Phyllachora.

In March, 1960, Professor Bugnicourt sent to the C. M. I. a specimen of 'black cross' which had been collected in Fiji. This was in excellent condition and it possessed mature ascospores. This is an interesting extension of the range of collections of this species. What is, indeed, surprising is that such a characteristic and conspicuous fungus has not been described before.

However, no species in Phyllachora or in an allied genus on banana agrees with this species, and a description is being published elsewhere. The purpose of this note is to inform pathologists concerned with bananas of its occurrence and to appeal for further material.

C. Booth

PERSONAL NEWS

C. M. I. News

Dr. G. C. Ainsworth has been appointed assistant director as from 1 April, 1961.

Paul Holliday has resigned from the Pool of Plant Pathologists to take up an appointment as lecturer in Botany at Hull University.

It is with deep regret that we have to record the sudden death of Mr. A. E. Trotman who was appointed Secretary C. A. B. in January this year. He has been succeeded by Sir Thomas Scrivenor C. M. G., B. A. (Hons. Oxon), lately deputy High Commissioner for Basutoland, Bechuanaland, and Swaziland.

The Director has been co-opted to the Council of the Institute of Biology and elected chairman of the London Branch.

Visitors

Among overseas visitors were: P. Martyn, South Africa; Dr. W. Gams, Austria; J. van Brummelen, Netherlands; Dr. K. S. Thind, India; A. G. Bailey, Nigeria; T. K. Kandaswamy, India; Dr. Brian Webster, Venezuela; A. A. Brunt, Ghana; Dr. F. M. L. Sheffield, Kenya; Dr. G. R. Bates, Federation of Rhodesia and Nyasaland; Dr. H. Campinis, Venezuela; Dr. M. Albornoz, Venezuela; Dr. R. L. Steyaert, Belgium, M. Kandaswaym, India.

Ten visitors worked in the Herbarium and Library for varying periods of time.

A party from the Natural History Society of St. Paul's School, London, also paid a visit.

Royal Society

Sir Patrick Linstead, rector of Imperial College, London, and Professor T. M. Harris, professor of botany at Reading, have been elected vice-presidents.

Professor C. V. Subramanian who is now specialising in the Hyphomycetes has bee been appointed professor of botany at the University of Rajasthan, Jodhpur, India. B. Tiagi has been appointed as reader.

B. E. S. Gunning has been appointed lecturer in botany at Queen's University, Belfast.

BRITISH MYCOLOGICAL SOCIETY

TRANSACTIONS

TEN YEAR INDEX

(1949-1957; volumes 31-40)

119 pages, 1961

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OVERSEAS NEWS

NEW ZEALAND

CEREAL AND GRASS VIRUS SURVEY

Dr. J. T. Slykhuis of the Plant Research Institute, Canadian Department of Agriculture, Ottawa, arrived in New Zealand from Australia on the 15th November and commenced an extensive tour of the main cropping and grassland areas of this country in order to survey the main virus diseases of cereals and grasses in this country. He was accompanied for the most part of this tour by Dr. Harvey C. Smith, who has previously been working on barley yellow dwarf at the Plant Diseases Division at Lincoln. Dr. Slykhuis was able to point out on oats and grasses three diseases which are very likely to be of virus origin, and have not previously been recognised in New Zealand. He left for another virus survey of cereals and grasses in India and Pakistan on the 2nd December.

The main features of these diseases are as follows:

Mosaic on Oats

The symptoms and field epidemiology of this disease resemble oat mosaic previously only described from the U.S.A. The characteristic symptoms on susceptible varieties at heading are a severe stunting and often a darker green appearance. The leaves develop pale, whitish streaks and blotches, especially on the young leaves, often giving a mosaic pattern of light and darker green areas.

This disease has been observed almost every year for over five years on the autumn-sown oats at Crop Research Division at Lincoln. Each year severe stunting and pale, chlorotic streaks were noticed, particularly in one variety, Steel, (also known as Sun II). Previous investigations on this disease showed that it was not seed-borne and Steel oat plants which had no symptoms were no more resistant to the disease in subsequent years than seedling plants grown from severely infected plants.

The symptoms, however, were particularly evident this year as large, circular patches, typical of soil-borne virus diseases, both at Crop Research, Lincoln and at another locality in Canterbury at Lakeside. At Lincoln, oats have been grown on the average at least twice every five years for the past thirty years.

At Lakeside the incidence of oat mosaic varies with the amount of previous oat cropping. Where there was no previous oat crop the incidence was nil; where there had been one previous oat crop in the previous 8-10 years there was a trace; where there had been two previous oat crops there was approximately 1 per cent. infection, and where there had been over three oat crops the incidence was approximately 50 per cent.

One additional feature of this disease was the fact that it has not been seen on any spring-sown oat crop, even where susceptible varieties had been grown in areas where the disease had appeared previously. Observations on varietal resistance showed that one variety, Algerian, showed no symptoms at all. Two other commercial varieties, Milford and Garton's Onwards, were fairly tolerant, whereas Steel, and Garton's Abundance were highly susceptible. The most promising new oat hybrids being developed at Crop Research Division also seem to have marked tolerance to oat mosaic as might well be expected.

Striate Mosaic Symptoms on Perennial Ryegrass

Symptoms of yellow blotching on the leaves of several grasses (Agropyron repens, Alopecuris pratensis, Arrhenatharium elatior, and Phleum pratense) were observed in several localities in the South Island.

Several previous attempts to transmit this virus by sap inoculation and aphids to other cereals and grasses failed, so it is possible that this virus has some other insect vector.

Striate Mosaic on Ryegrass & Timothy

Symptoms consisting of very fine chlorotic streaks varying from a few to many were observed particularly on single plant selections from the N. Z. Italian ryegrass selections at Palmerston North. The same symptoms were also noticed to a lesser extent in N. Z. Short Rotation, N. Z. Long Rotation, and also in Timothy parent plants in the same area.

Approximately 40 per cent. of the Italian ryegrass plants were infected compared with about 15 per cent. in the Timothy, Short Rotation, and Long Rotation ryegrass. No symptoms were seen on Cocksfoot or N. Z. Perennial ryegrass in the same area. Dr. Slykhuis considers that the symptoms of this disease resemble those of wheat striate mosaic in Europe and North America and that a leaf hopper is the most likely vector.

Crop Research Division, Christchurch. Harvey C. Smith

INDIA

AT THE INDIAN AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI

Mango Malformation

It was earlier reported (C.P.NEWS, 5: 59, 1959) that some eriophyid mites have always been found associated with malformed shoots and inflorescences. Eriophyid mites were also found to be present in the apical bud scales of the growing point of apparently healthy shoots of mango. The disease was successfully reproduced by these mites, collected from healthy as well as diseased mango shoots, indicating the possibility of their being the cause of the disease.

Onion Mosaic

A mosaic disease of onions (Allium cepa L.) characterized by chlorotic streaks on the leaves has been observed at the Indian Agricultural Research Institute, New Delhi. The disease could not be transmitted through sap, but is readily transmitted by Aphis gossypii Glov.

Downy Mildew of Maize

It has been established by cross inoculation tests that the downy mildew (Sclerospora philippinensis Weston) of kans (Saccharum spontaneum L.) can infect maize and thus serve as a source of primary infection to the maize crop, infection on kans being systemic and perennial.

Sugarcane

Fundamental studies on the physiology of parasitism of Colletotrichum falcatum have been in progress. Nutritional studies of the host/parasite relationship have shown that the addition of a nitrogen source, organic or inorganic except nitrite, at the site of inoculation, tends to increase the linear spread of infection of both virulent (light) and avirulent (dark) isolates in the cut canes of Co. 647 and Co. 312. If the inoculum is reinforced with potassium salts it has no effect on virulence of the isolates. Arginine, valine, leucine, and asparagin significantly increase the virulence as well as growth of both the isolates. Amino acids like dl-phenylalinine and tyrosine, containing the phenyl group, inhibited the linear spread of infection in the inoculated canes, but no inhibition of the growth of the fungus was observed in the liquid cultures containing these two amino acids. Various vitamins and growth regulators tested did not show any significant effect on the virulence of the light or the dark isolate. The cane crop grown with heavy doses of N appeared to exhibit greater susceptibility.

It has been observed lately that red rot is appearing in an epidemic form in some new localities in the Punjab and Andhra Pradesh.

Glomerella cingulata

The disease referred to in C.P. NEWS of January 1961 has been reproduced experimentally and pathogenicity of the fungus, whose identity has been confirmed by C.M.I., proved. This appears to be the first proven record of G. cingulata on sugarcane. There is a previous record from Jamaica in 1952, but no inoculation trials are reported.

Rust of Sugarcane

Puccinia erianthi Padwick & Khan appears to be on the increase and has been reported from several new localities affecting new varieties. Indications of physiologic specificity have been obtained in some of the rust collections tested so far.

GENERAL

The 48th Indian Science Congress was held during the first week of January, 1961, at Roorkee (U.P.). The Section of Agricultural Sciences was presided over by Dr. B.L. Chona, mycologist at the Indian Agricultural Research Institute, New Delhi.

In the presidential address, Dr. Chona briefly referred to the importance of the sugar industry to India and discussed in detail the history of red rot epidemics, their recurrence, and the causes thereof, and made suggestions for its control, indicating further lines of research.

Thirty papers of plant pathological interest were read and discussed.

R.S. Vasudeva

INDUCING SPORULATION OF

Colletotrichum camelliae

Injury to the fungal mycelium is known to stimulate sporulation in certain fungi, though not many records of this phenomenon exist in literature. McCallan and Chan (1944) demonstrated that by scraping the colonies of Alternaria solani the fungus could be induced to sporulate readily. An instance of profuse sporulation by Colletotrichum camelliae consequent on injury to the fungal mycelium in agar culture was recently observed.

C. camelliae sporulated sparsely on potato dextrose agar medium in 7-10 days at laboratory room temperature (25-28°C.) in diffuse light. Under these conditions spore masses sometimes developed when the cultures were 3 weeks old, though usually they were not formed. But when the young mycelium, growing on the agar discs, was cut with a sterile scalpel numerous spore masses were noticed along the incision after 48 hours, both in diffuse light as well as in darkness at laboratory room temperature. The spore masses continued to increase in size and supplied suitable material for spore germination tests. Production of spore masses also occurred invariably on bits of autoclaved tea stem, but only 3-4 weeks after inoculation, whereas a 5-day-old colony of C. camelliae on potato dextrose agar when incised produced spore masses 2 days later. Inducing sporulation of C. camelliae by incising the fungal mycelium in agar culture was repeatedly successful. The technique may prove useful in the case of other species of Colletotrichum, many of which have been reported to sporulate poorly in natural and synthetic media.

REFERENCE

McCallan, S.E.A. & Chan, S.Y. (1944). Contr. Boyce Thompson Inst. 13:323-335.

UPASI Tea Experiment Station,
Devarshola,
S. India.

C.S. Venkata Ram

MALAYA

A correction is needed to the Malay notes appearing in C.P. NEWS of October, 1960, p. 61. The research work was, in fact, done by the whole Plant Pathology Department and reported by F.W. Hutchinson. The laboratory screening of fungicides against Fomes lignosus was actually carried out by R.A. Fox, who gave an interesting description of his results to the 6th Commonwealth Mycological Conference. They will be included in the report of the Conference to appear shortly.

MAURITIUS

Bacterial Wilt of Broad Bean

On 25.4.56 diseased specimens of the broad bean plant, Vicia faba L., known by the Indian growers under the name of 'bokla' were forwarded to the writer, then Plant Pathologist of the Department of Agriculture, Mauritius, from Floreal in Plaines Wilhems district.

The external symptoms exhibited were a blackening and rotting of the roots, a blackening of the cortex at the base of the stem and a blackening and rotting of the leaves, beginning along the margins. Internally, the vascular tissue had turned brown at the base of the stem and a white gum oozed from cut surfaces of the stem and roots.

Inoculation of young tomato plants with an isolate (culture Bo. 71) obtained from diseased stem tissue resulted in wilt and death of the plants. The disease was in consequence attributed to Pseudomonas solanacearum (E. F. Sm.) Dowson. Its occurrence was mentioned in the Annual Report, Dep. Agric., Mauritius, 1956, p. 56.

Culture no. 71 was forwarded on May 9, 1956, to Dr. W. J. Dowson at Cambridge University, who forwarded it as a strain of P. solanacearum to the National Collection of Plant Pathogenic Bacteria. In a letter to the writer dated Aug 18, 1959, Dr. A. Kelman, of the North Carolina State College, who had received the culture from the National Collection, informed him that as a result of inoculations made, he had classed it as a valid culture of Ps. solanacearum.

G. Orian

NORTHERN RHODESIA

MAIZE YELLOWS: This disease was first recorded in December, 1958, when it was widespread and severe. It reappeared in December, 1959, though not on the same scale. The main symptoms are general chlorosis correlated with slow growth. In severe cases the young leaves in the centre of the plant are blanched. The disease is noted at the beginning of the season on young plants up to 3 ft. tall. Most plants appear to recover but it is believed from observation that yields are greatly reduced. Similar symptoms in S. Africa have been attributed to deficiency of zinc and experiments to test this possibility are being conducted here (J. B. M. Vogt, Chemist). No conclusions can yet be drawn. Streak was again very prevalent throughout the Territory especially on late planted crops.

WHEAT: Wheat was treated at 1-, 2-, and 4-weekly intervals to observe control of Helminthosporium sativum during the rains. Only weekly sprayings had a significant effect, the yields being increased by about 20 per cent. Reduction of the grain blackpoint percentage was not significant. It is concluded that spraying does not give a worthwhile control of the disease. (B. E. Mounter, Plant Breeder).

BULRUSH MILLET: Work on this crop is going on in a small way. The main disease problem is head smut (Tolyposporium penicillariae) and breeding work is in hand to try to combine the high yielding capacity of the var. Tjolotjo, which is smut susceptible, with the smut resistance of the var. Birdproof, a poor yielder. (E. Mudenda, Plant Breeder).

GROUNDNUTS: Investigations of "pops" was continued (J. B. M. Vogt, Chemist, and J. Smartt, Plant Breeder, see C. P. NEWS 6: 30, 1960). In experiments in the Northern Province there was a marked response to application of lime at 300 lb./acre and at one locality there was a response, not statistically significant, to boron application at 5 lb./acre. Work on this problem continues.

POTATOES: Work was continued in collaboration with V. J. Montague, Potato Breeder of the Salisbury Experiment Station. Several varieties, notably Pimpernel, Walanga, and Loman 43-35, continued to show good field resistance to late blight

and are recommended for growing during the rains. But none of them is entirely satisfactory because of consumer dislike of yellow flesh in Pimpernel, reputed bad storage qualities of Loman, and poor tuber quality of Walanga. The search for more acceptable varieties will continue. Bacterial wilt (Pseudomonas solanacearum) is still the next disease of importance and one of the commonest received at Mount Makulu for identification.

CASSAVA: In the course of work on this crop it was estimated that mosaic can reduce the yields by as much as 40 per cent. Selection of resistant varieties continues (E. Mudenda, Plant Breeder).

TOBACCO: The most notable disease was wildfire (Pseudomonas tabaci) which destroyed the Burley experiments at Mount Makulu. The disease was also noted on Turkish tobacco on European farms near Lusaka, where it caused damping off in seed beds and did serious damage in the field. Frogeye (Cercospora nicotianae) was in general the commonest disease of seedbeds. Anthracnose (Colletotrichum tabacum) was recorded only from the Southern Province, and it appears that the fungicides thiram and zineb continue to give good control of the disease.

COTTON: In the search for cash crops for the peasant farmer the Department of Agriculture has recently taken a renewed interest in cotton and an extensive series of trials has been conducted covering the whole territory. (A. N. Prentice, Chief Research Officer, and T. Bosse, Agronomist). The work has been done in close collaboration with the Cotton Research Station at Gatooma. Yields have in general been good to very good wherever the crop has been sprayed with endrin (to be replaced by sevin in future trials) against the numerous insect pests. It appears that biologically, prospects for cotton are good. Varieties grown here are being assessed for resistance to blackarm, the only major disease recorded to date.

NINDI (Aeolanthus myrianthus): In the search for high value, low volume cash crops for African farmers this plant has been singled out for special study. The species is indigenous and has been grown for many years on a small scale by European farmers in the Abercorn district for its essential oil distilled from the flowers, which is used in the manufacture of scented soaps. In working out the agronomy of the crop it has been found to be very susceptible to attack by root-knot nematode (Meloidogyne javanica), heavy infestations of which have been noted associated with unthriftiness in the field. Rot knot has also been found on young plants in seedbeds.

Mount Makulu. A. Angus

NYASALAND

Tobacco

Brown leafspot, caused by Alternaria longipes (Ell. et Eb.) Mason, was serious in the Kasungu area, and occurred in other growing areas which have been largely free of this disease in the past. The reason for the severity of the disease this season is thought to have been climatic. The country experiences a three week drought in January which coincided with topping of the crop. The drought was succeeded by a very wet February. The topped plants became rank in this period, probably due to a nitrogen release on re-wetting of the soil, leading to an unbalanced N/PK relationship which is known to increase susceptibility of the plant to A. longipes. This suppositions was tested by taking soil samples from a badly affected field in the Kasungu area and finding out what quantities of nitrogen would be likely to be released on wetting after air drying for three weeks.

Normal estate practice in the area, based on work done by B. E. J. Wheeler (Miscellaneous Publication No. 15, Commonwealth Mycological Institute, 1958. "Investigations on Alternaria leafspot of flue cured tobacco in Nyasaland.") has been to apply nitrogen at levels below 28 lb./acre. The amounts of nitrogen released were in excess of this figure, and represent nitrogen available to the crop at the latter end of the growing season. Considerable unbalance of the N/PK relationship was therefore caused.

In addition, the wet weather in February provided ideal conditions for the

development of the disease, and by slowing harvesting increased the period during which susceptible leaf was in the field.

Tobacco anthracnose, caused by Colletotrichum tabacum Böning, occurred on 14 estates during the year. The disease is still restricted to the Southern Province, and does not appear to be gaining ground.

Leaf curl virus was more prevalent than it has been for some time past, and a few cases of bushy top, a comparatively new disease caused by a virus related to rosette was found in all growing areas. The peculiar growing conditions during the year caused a certain amount of leaf scorch and red rust, both physiological conditions which were confused with A. longipes symptoms, giving rise to alarming reports of an Alternaria epidemic.

Wildfire, caused by Pseudomonas tabaci (Wolf & Foster) Stevens, again appeared only on Burley tobacco on one estate. This disease first appeared in 1957 and has appeared every year since. On enquiring into the estate's agronomic practices is was discovered that groundnuts were brought into the rotation in 1957 on one part of the estate, and an increasingly large area of the estate has been put into this rotation in long strips. Wildfire is restricted to that part of the estate where a rotation including groundnuts is practised.

Cercospora nicotianae Ell. et Ev. was the commonest leaf disease of Turkish tobacco. Erysiphe cichoracearum DC also occurred. Root knot nematode, Meloidogyne sp., was very serious in the Northern Province, and may well become a limiting factor on this late planted crop in the very sandy soils in which it is grown.

Tea

Armillaria mellea (Fr.) Quél. still causes a certain amount of damage. An outbreak occurred in a 30 year old field after ringbarking of shade trees prior to removal. Fructifications were found at the base of tea bushes infested in this outbreak. No rhizomorphs were noted, infection of the tea having apparently come from contact of the tea roots with infected roots of the Grevillea robusta shade trees.

A survey conducted by G.C. Martin, Senior Helminthologist of the Federal Ministry of Agriculture, revealed the presence of root knot nematodes, Meloidogyne spp., in all but one tea nursery in the Cholo/Mlanje area. M. javanica was the commonest, being found in 70 per cent. of the nurseries; the remainder of the nurseries were, with one exception (M. incognita var. acrita Chitwood), found to be infected with M. arenaria (Neal) Chitwood. Although considerable damage was done by these nematodes in the nursery, little or no damage was found in mature plantings.

Groundnuts

Rosette of groundnuts was unusually severe in the year under review, and caused almost total loss of crop in certain areas of the Southern Province. The disease was found at its worst in those areas where mean annual temperatures are 70-75°F. and mean annual rainfall 30-35 ins. Exceptionally dry conditions after the first planting rains evidently favoured build-up of the vector. The over-wintering hosts of the vector are not known, but it is thought that volunteer groundnuts are not the only hosts. In all areas visited volunteer groundnut plants would be destroyed at least 2 months before subsequently planted groundnuts would have germinated and it would appear that other over-wintering hosts might be implicated.

Coffee

Armillaria mellea was confirmed on coffee for the first time this year. This was in a garden where most of the Albizzia shade trees have been killed by the fungus. Despite this record, coffee can still be considered resistant to A. mellea in Nyasaland. Fructifications of the fungus were produced, but they apparently only last for a very brief period, which may account for previous observations that A. mellea does not commonly produce fructifications in Nyasaland.

The Fusarium bark diseases are widespread and are still causing much destruction.

The stem pitting condition of coffee was found to be very severe in August in a field of variety KP 532 planted in November 1958. Marked pitting of the stem was noted and a marginal chlorosis and distortion of the young leaves, which had necrotic tips, appeared to be associated with it. The older leaves were markedly reflexed on the laterals, hanging down with the tips twisted back towards the main stem.

Fusarium bark disease in one of its three forms, viz. Storey's bark disease, scaly bark and collar rot, was found in all areas by M.A. Siddiqui, and frequently all three forms were found in one area. The disease occurs most commonly in the presence of debilitating factors such as exposure, overbearing, and pest attack. Nine species of Fusarium have been isolated from diseased wood and soil but only one of these, F. stilboides Wr. forma, has been consistently isolated from all three forms of the disease. Its identity as causal agent has been confirmed by inoculation tests, the first series of which have shown that Storey's bark disease can be successfully induced by inoculation with F. stilboides from collar rot and scaly bark forms of the disease. Determinations were confirmed by Dr. W. L. Gordon. Full time research is being devoted to this disease.

Cacao

Glomerella cingulata (Stonem) Spauld & Schrenk caused an angular leaf spot on the young leaves of cacao. It also caused a pod rot, and in the latter phase may well become serious in the rather severe climatic conditions of the lower Shire River valley.

Root knot nematode, Meloidogyne javanica, was found to be present on unthrifty trees. The above ground symptoms are merely those of slow growth, and difficulty is encountered in establishing the young plants in infested patches. Bananas are being used as a nurse shade. Should the nematodes prove to be serious obstacles in the culture of the cacao tree, it would be advisable to seek another shade as bananas have been shown to be excellent hosts of M. javanica, and were found to be heavily infected in this case.

Miscellaneous Crops

Late blight, Phytophthora infestans, of potato overshadows all other diseases. Fungicidal spraying of the rain-grown crop is thought to be a practical impossibility, even if it were economically feasible and its has been decided to use potato varieties showing polygenic field resistance.

Late blight (Phytophthora infestans) was first recorded on tomatoes during the year under review. Widespread fruit rotting and foliage destruction was caused during the rains. During the dry season an irregular discrete brown lesion with a water soaked halo appeared mainly at the blossom end of two or three fruits on each truss. The lesion rarely develops beyond this, although occasionally secondary organisms cause rotting of the tissues.

Downy mildew (Pseudoperonospora cubensis) was recorded for the first time this year.

Lettuce mosaic virus was recorded for the first time this year on London Cos lettuce.

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Printed lithographically in Great Britain at the University Press, Oxford, by Vivian Ridler, Printer to the University

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